The CHICAGO NATURALIST

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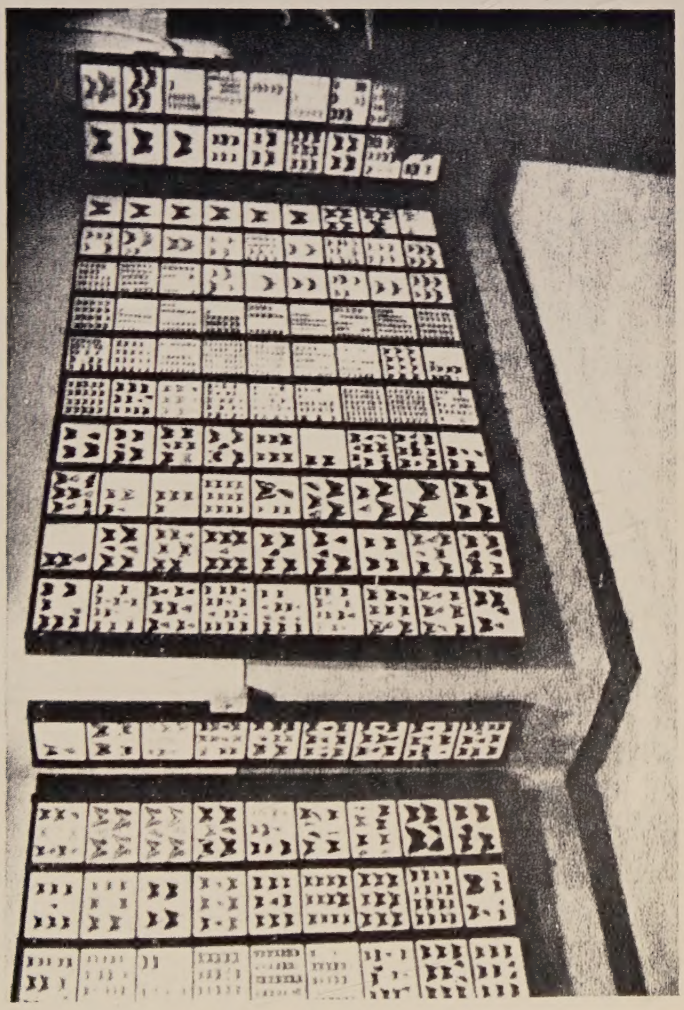

A Corner of Dr. Henderson's Private Museum.

Lepidoptera and Leisure

W. F. Henderson*

Hobbies and vacations may be said to have at least one element in common, each provides a change in scene. Almost everybody takes a vacation once in awhile, but the penalty in preparing for it and in getting caught up afterwards often nearly defeats the benefits derived. But with a hobby it is different. My hobby offers me a place of refuge from the daily job in almost any bit of spare time. Furthermore, my hobby is one of those pastimes that is considered almost useless and even a waste of time by some of my acquaintances. But I maintain that having fun in a reasonable amount is not wasting time, but is an important ingredient in the well balanced life.

I collect butterflies. It seems that people *are,* or *are not,* natural born collectors *of something.* If you are not, don't try to force yourself to be one! It was in 1904 that I got started. It was a nice hobby for a lad in school because it cost practically nothing. Confucius say, "Costly hobby soon make family poor."

Aside from the mere activity of collecting butterflies, I have been led by this hobby into many fascinating fields and circumstances. One learns a lot of the fundamental principles of biology when one tries to rear insects from the eggs. Classification leads to the literature and one learns a lot in the use of scientific books. By correspondence I have become acquainted with scientists in other states and in other countries. Maps are consulted and places located in distant parts of the world, thus stimulating interest in geography, climate, etc.

Being a chemist by profession, naturally my curiosity was stirred in regard to what chemists have done in the field of insects, and I found that this field has not been overlooked. The structural material, chitin, came early to the chemists' attention. It is the animal substance analogous to cellulose in plants. Chemists assign the formula $C_8H_{13}O_5N$ to chitin. Some hint as to its structure is given by the fact that, when boiled with hydrochloric acid, it yields glucose-amine and acetic acid.

Some years ago, Wieland, a German chemist, and his associates secured millions of butterflies and extracted some pigments from their wings. From 25,000 specimens of the common white butterfly of Europe, 134 grams of wings were secured. These yielded 5.6 grams of a white nitrogenous pigment which was called leucopterin (*leuco,* white; *pterin,* wing). Other pigments from other species were isolated.

*Dr. Henderson is Chief Chemist, The Visking Corporation, and a Life Member of the Chicago Academy of Sciences. This article is adapted from one published in the March, 1943, number of *The Chemical Bulletin,* which has kindly granted us permission to reprint, including the use of the accompanying illustrations.

As a group these substances are called pterins. Two yellow pterins are known, xanthopterin and chrysopterin; a red one is called erythropterin. These pigments are deposited in the form of fine particles just under the surface layer of chitin, on the scales that clothe the wings. In speaking of these pterins, we might here recall the fact that the butterflies and moths themselves are known as Lepidoptera—*lepido* coming from the Greek, meaning scaly, and *ptera* referring to the wings — the "scaly wings."

The blue in butterflies' wings cannot be extracted by solvents. The reason for this is that the blue colors are "structural" colors. They are produced by the selective reflection of light. By a slight change in the angle of illumination, iridescent effects are often produced. Structural blue, when combined with the yellow pigments, may give rise to a metallic green appearance. Endless combinations can be

Pinning Specimens

found in the wings and almost every conceivable shade of color exists. Black, so common in butterflies, is associated with the same pigments found in black hair, horses' eyes, liver, etc. These are called melanins. Their constitution has never been fully established.

Several years ago I was persuaded to chip in and help finance a collecting expedition that a man and his wife took to Australia and the South Sea Islands. Out of this venture came a series of shipments of magnificent specimens out of what is now the very center of jungle warfare. I am still working on the mounting and classification of the large number of specimens that came from this expedition. As I open up the gorgeous wings of one after another, I often wonder how the war will affect certain species and their food plants.

Sometimes relatively insignificant changes in local situations have far-reaching effects on certain species. This was illustrated very well

(Continued on page 36)

What is a Naturalist? A Study in Natural History

Karl P. Schmidt[1]

1. On reading biographies of naturalists

There are two sides to the problem of how to become a naturalist. Sometimes I think this problem can be worked out, and that one can *learn* to be one. Other times it seems that naturalists are born and not made, at least to the same extent that musicians or painters or poets must be born with their native talents. It is not quite the same as being born, or getting to be, a scientist, though of course most naturalists are either scientists or think that they are. One might well ask for a definition of the term "naturalist"; but this proves to be a question best answered by illustrative examples. Those of us who work in museums of natural history have been asked so often how one may become a naturalist that we have had to think up some kind of an answer. For myself, I hope I have been naturalist enough to give different answers to different people.

One of the answers consists of the recommendation that the student acquaint himself with a few great naturalists and see whether he can find out *what* has made them naturalists. This will develop a working definition of the term "naturalist." The simplest way to go about such a project is to read biographies of naturalists, and that should probably mean beginning at the logical beginning, with the history of biology, since biology plainly has its roots in "natural history." The fact is that one learns a good deal of biology, and specifically the kind of biology necessary to a naturalist, from studying its history. What one learns by this "historic method" has good mental hooks. If there were a really first-rate work, not too much simplified, one might perhaps become a biologist in this way (let alone a naturalist), and just about painlessly. Everyone who engages in research in some special field of science acquires a knowledge of the history and development of that field.

The sad fact is that there is no entirely satisfactory history of biology. Professor Locy's books, *Biology and its Makers*[2] and the more recent *Story of Biology*[3], are the most readily available works and I might recommend them more highly if I did not remember that he was a vain man, and that his son swiped my new pocket knife with chain when I was seven. I suppose the reader may think scientists (and naturalists) don't hold grudges, but he would be wrong. There

[1]Chief Curator of Zoology, Field Museum of Chicago.

[2]Locy, W. A., 1908. Biology and its makers. New York, Holt and Co., xxvi+477 p., 123 fig. [Rev. Ed. 1915.]

[3]Locy, W. A., 1925. The story of biology. Garden City Publ. Co., Garden City, N. Y., xiv+495 p., 140 fig.

is an English translation of Nordenskiöld's *History of Biology*,[4] but this is too heavily Germanic, minor German scientists receiving full mention, while English and American workers are much less fully treated. There is one most excellent work—Miall's account of early naturalists.[5] Unfortunately, this is limited to the period before 1800, and only whets the appetite, and thus one will be driven to read Singer's *The Story of Living Things*,[6] which, though it includes some special pleading for vitalism, and in spite of its positively misleading title, is nevertheless the best history of biology available. This is perhaps because Dr. Singer is a specialist in the history of the biological sciences, so that his general volume is a compression and selection from more specialized volumes. A good general introduction to the ideas about evolution is available in Osborn's book *From the Greeks to Darwin*.[7]

Histories of biology being few and inadequate, the would-be naturalist is driven to my first suggestion, to reading biographies. Some stimulus may be derived from the readable accounts of the lives of a somewhat erratically selected series of naturalists in *Green Laurels*[8] by Donald Culross Peattie. Full length biographies of naturalists and of biologists in general are numerous and one might well get lost in this field of literature. Having found Huxley's "Life and Letters" well worth re-reading, I shall not feel too much pity for those who may be inveigled into following my advice. At this point it is perhaps necessary to enquire of the reader just what he has read in the way of general biological works; and it is difficult to avoid the fundamental recommendation of *The Origin of Species*.[9] This work is not altogether easy to read; but it is a book so much written about, and its subject involves so much of biology and so particularly that kind of biology that makes biologists also naturalists, that there is no alternative. If the beginner is really not up to it, he may try to get a running start by reading *The Formation of Vegetable Mould through the Action of Worms, with Observations on their Habits*[10] as an introduction both to Darwin and to his methods of scientific observation, and then

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[4]Nordenskiöld, Erik, 1935. The history of biology, a survey. Tudor Publ. Co., New York, xii+629+xv p., 32 illus. [Original Ed. in Swedish, 1920-1924.]

[5]Miall, L. C., 1912. The early naturalists their lives and work (1530-1789). Macmillan and Co., London, xi+396 p.

[6]Singer, Charles, 1931. The story of living things a short account of the evolution of the biological sciences. Harper and Bros., New York, xxxv+272 p., 194 fig. [Title of the English Ed. "Short history of biology; a general introduction to the study of living things." xxxv+512 p. illus. Oxford.]

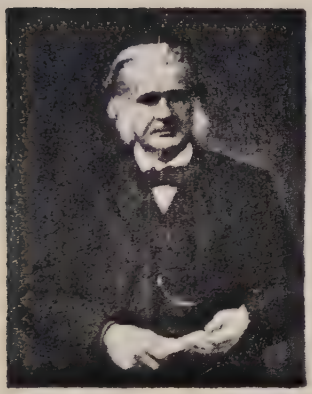
[7]Osborn, H. F., 1894. From the Greeks to Darwin, an outline of the development of the evolution idea. Macmillan and Co., New York, x+259 p.

[8]Peattie, Donald Culross, 1936. Green laurels, the lives and achievements of the great naturalists. Simon and Schuster, New York, xxiii+368 p., illus.

[9]Darwin, Charles, 1859. The origin of species by means of natural selection or the preservation of favored races in the struggle for life [any edition, for example] Appleton and Co., New York, 2 vols. xxvi+365, vii+338 p. 1899.

[10]Darwin, Charles, 1892. The formation of vegetable mould through the action of worms, with observations on their habits. D. Appleton and Co., New York, 326 p. illus.

the first volume of Romane's *Darwin and after Darwin*,[11] which still seems to be the most readable exposition of Darwin's basic principles of evolution. This much of a start in general biology is essential for the understanding of the biographies next to be recommended.



T. H. Huxley

Life and Letters

OF

Thomas Henry Huxley

BY HIS SON

LEONARD HUXLEY

IN THREE VOLUMES

VOL. III

London

MACMILLAN AND CO., LIMITED

NEW YORK THE MACMILLAN COMPANY

1903

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Title page and frontispiece* for *Life and Letters of Thomas Henry Huxley* (Eversley Edition, Vol. III).

Huxley's *Life and Letters*[12] by his son Leonard is readable, and will leave you with a warm feeling of admiration for a great scientist who was in the thick of the fight over the evolutionary view of nature precipitated by *The Origin of Species*. I am sure the reader of the "Life" will read a few volumes of Huxley's "Essays" also, from which it will be evident that a naturalist is likely to devote some time to the interpretation of scientific matters to the general public. If the reader still thinks (as most popular writers seem to do to this day) that Huxley was a materialist, he should read the essay on Hume,[13] which, with

[11]Romanes, G. J., 1897. Darwin, and after Darwin . . . I. The Darwinian theory. Longman's Green and Co., London, xiv+460 p., 125 fig.

[12]Huxley, Leonard, 1900. Life and letters of Thomas Henry Huxley. 2nd ed., 1903, 3 vol., Macmillan and Co., London, xii+463, vi+476, vi+501 p., 3 portraits.

[13]Huxley, T. H., 1894. Hume, with helps to the study of Berkeley Essays. American Ed., 1902, Appleton and Co., New York, xiv+321 p.

a little study of the work of our own William James,[14] affords a respectable philosophic background for any would-be scientist. Huxley was one of a great group of English scientists contemporary with Darwin and involved in the development of the theory of organic evolution. These included especially Darwin, Wallace, Huxley, Hooker, and the geologist Lyell. "The Life of Hooker,"[15] by Leonard Huxley, is especially to be recommended in order to include a great botanist. This will be especially appreciated by those who have been so fortunate as to have seen Kew Gardens in London, and in consequence are conditioned to think the Hookers, father and son, great.

Huxley had no mean set of disciples, and there are plenty of books about him and apparently all a little too much inclined to gush.[16] If you want to read something further while you are on Huxley, try the diary kept during his voyage on the *Rattlesnake*.[17] This book will introduce another answer to our fundamental question of how to become a naturalist; if you read their biographies to see what manner of men they were, you must read their works to see what kinds of things they did. Since the biologist almost without fail becomes a naturalist when he travels, this will bring us to the heart of the problem of what a naturalist is.

Travels by naturalists, however, form a distinct literary category and we must list a few more *musts* in biography. There are, of course, the four volumes of Darwin's "Life and Letters,"[18] also, happily, edited by a son. This account of the life of Darwin, mirrored in his letters, is really a grand work, and it should not be approached too lightly, and above all, not too hurriedly. Perhaps one should be something of a naturalist and a biologist before embarking on it; but if one reads it at the beginning of one's career, it can be read again later, and, I suspect, yet again. It is a set of books to own for oneself. As with Huxley, it seems a needless waste of time to embark on reading other books about Darwin, of which there are many.[19] Some of these attempt a considered view of the man Darwin, and of his time. The

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[14]James, William, 1907. Pragmatism: a new name for some old ways of thinking; popular lectures on philosophy. Longman's Green and Co., New York, 13+3-309 p.

[15]Huxley, Leonard, 1918. The life and letters of Joseph Dalton Hooker. Appleton and Co., New York, 2 vol. x+546; vi+569 p. illus.

[16]Clodd, Edward, 1902. Thomas Henry Huxley. Dodd, Mead and Co., New York, xiii+252 p.

[17]Huxley, Julian, 1935. T. H. Huxley's diary of the voyage of *H.M.S. Rattlesnake*. Chatto and Windus, London, viii+372 p. 13 pl.

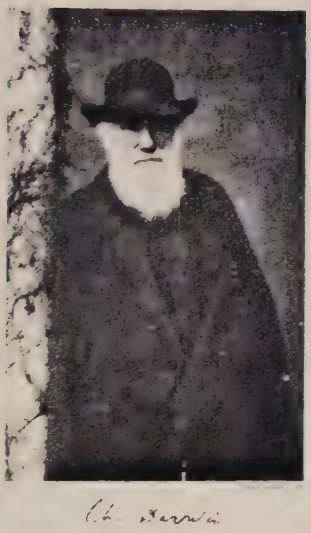
[18]Darwin, Francis, Editor, 1888. The life and letters of Charles Darwin, including an autobiographical chapter. Appleton and Co., New York, 2 vol., viii+558, vi+562 p., 6 pl. American Ed.

———, 1903. More letters of Charles Darwin, a record of his work in a series of hitherto unpublished letters. Appleton and Co., New York, 2 vol., xxiv+494, viii+508 p., 14 pl., 13 fig. American Ed.

[19]Ward, Henshaw, 1927. Charles Darwin, the man and his warfare. Bobbs-Merrill Co., Indianapolis, x+472 p., illus.

Barzun, Jacques, 1941. Darwin, Marx, Wagner critique of a heritage. Little Brown, and Co., Boston, xii+420 p.

more recent of these evaluations of Darwinism by non-biologists seem to the writer equally to *misinterpret* Darwin's personality, the scientific method, and the continuing significance of his contributions to biology. Our young naturalist does not need such interpretations—he should form, and will form, a sound opinion of his own in due course.



Ch. Darwin

MORE LETTERS OF CHARLES DARWIN

A RECORD OF HIS WORK IN A SERIES OF HITHERTO UNPUBLISHED LETTERS

EDITED BY FRANCIS DARWIN, FELLOW OF CHRIST'S COLLEGE, AND A. C. SEWARD, FELLOW OF EMMANUEL COLLEGE, CAMBRIDGE

IN TWO VOLUMES
ILLUSTRATED

VOL. II

NEW YORK
D. APPLETON AND COMPANY
1903

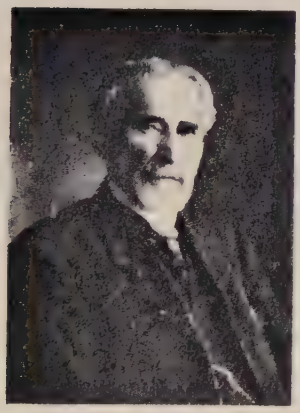
Title page and frontispiece from *More Letters of Charles Darwin* (Appleton, Vol. II).

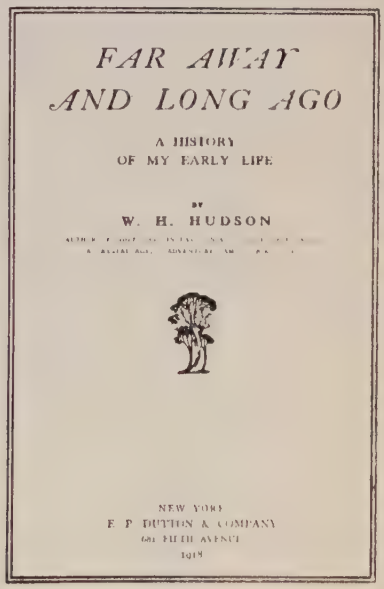
Before reaching the last of this first series of suggested biographies, it is well to bring up the volume *Leading American Men of Science*,[20] which consists of short essays on a series of Americans, some of whom are truly great. The essays, furthermore, prepare the mind, and I hope whet the reader's appetite, for the last of my recommendations. Unfortunately, some of the desires so aroused cannot be satisfied. It is nothing short of pitiful that so colorful an American scientist as Edward Drinker Cope should, in this modern day of readable biography, have nothing more available about him than Marcus Benjamin's essay in *Leading American Men of Science* and Osborn's heavy compilation.[21]

[20]Jordan, D. S. (Editor), 1910. Leading American Men of Science. Henry Holt and Co., New York, vii+471 p., 17 illus

[21]Osborn, H. F., and Helen Ann Warren, 1931. Cope: master naturalist, the life and letters of Edward Drinker Cope with a bibliography of his writings classified by subject a study of the pioneer and foundation periods of vertebrate palaeontology in America. Princeton University Press, Princeton, xvi+740 p., 30 fig

Cope was a long time editor of the *American Naturalist;* and we may deduce that he must have been one. A companion volume might give us some review of eminent "American Men of Science" of a later generation. I miss Theobald Smith, for example; but such a volume remains to be written.



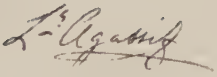


Title page and frontispiece from *Far Away and Long Ago* (Dutton)

Not for its literary merit, though it is considerable, but for its picture of an American naturalist and of an American era in natural history to be obtained in no other way, we come to Dall's account of the life of Spencer Fullerton Baird.[22] Baird spanned the generations from Audubon and the wilderness to the modern age, from the time when one still became a naturalist by one's own effort (much as Lincoln became a statesman) to the days of the Ph.D. machinery, through which a naturalist may occasionally pass unharmed. Baird knew and aided all the American naturalists of his day, and through his correspondence with them, we come to glimpse as living persons some who are otherwise no more than names scattered over the American fauna

[22]Dall, W. H., 1915. Spencer Fullerton Baird, a biography including selections from his correspondence with Audubon, Agassiz, Dana, and others. Lippincott Co., Philadelphia, xvi+437 p., 19 pl.

and flora. Nowhere else can we read of Robert Kennicott, founder of the interest in natural history in Chicago, dead in Alaska at thirty-four, his name preserved in Chicago's informal association of working naturalists, the Kennicott Club, as Baird's is in Washington. Baird himself looms as something of a giant in Dall's sympathetic work. There were few American projects of a biological nature that he did not have some hand in; and one feels that the fact that he is so little known is due to an almost incredible modesty, to his lifelong preference for promoting the work of others rather than his own; and one lays down the book at the end, if it has been thoughtfully read, with the feeling that he was the best judge of what was, after all, his own and his best work.



LOUIS AGASSIZ

HIS LIFE AND CORRESPONDENCE

EDITED BY
ELIZABETH CARY AGASSIZ

IN TWO VOLUMES
VOL. II.

BOSTON
HOUGHTON, MIFFLIN AND COMPANY
New York: 11 East Seventeenth Street
The Riverside Press, Cambridge
1885

Title page and frontispiece from *Louis Agassiz* (Houghton, Mifflin, Vol. II).

The naturalist who turns to a literary career is perhaps best exemplified by the Argentine Englishman W. H. Hudson. Hudson's recollections of his childhood on the Pampas in *Far Away and Long Ago*[23] bears the stamp of the poetic insight that marks the great imaginative writer however much he may draw upon the facts of nature for his

[23]Hudson, W. H., 1918. Far away and long ago. E. P. Dutton and Co., New York, xii+332 p., frontisp.

material. Every naturalist will wish to have at least one or two more of Hudson's volumes on his shelves.

I have left my own favorite personage and his biography for the last. Louis Agassiz was as much American as Swiss, the more American, perhaps, for the immediacy of his European origin. It is clear that he was born a naturalist, and that his friends conspired to make him a great one; and on second view, those friends were his because he was already great. His whole story is romantic; he was what the Germans call a *Sonntagskind*. His American wife has done him justice; and if the reader omits to read her book,[24] the loss is his. William James, who seems to me to be an American scientist of heroic stature, sums up this romance of a personality with so much gold and so little dross in an essay in *Memories and Studies*.[25]

What naturalists do, and what therefore the would-be naturalist should do, can be learned from their lives, but perhaps still better from their works. The recommendation of a further list of books to be read thus becomes the subject of another essay. By way of conclusion it is necessary to remind the reader, and to point the reminder by reference to the lives of these naturalists, that no one becomes a naturalist by reading books alone. Such reading can be only an *introduction* to Natural History.

This is the first of a series of three articles by Mr. Schmidt. The remaining will follow in succeeding issues.—Ed.

(Continued from page 28.)

in 1939 right here in America. In 1898 Henry Schaus (died June, 1942) found a new species in southern Florida. He named it *Papilio ponceana* and described it in 1911 in the technical literature. It has always been rare. In September, 1939 a terrific hurricane swept southern Florida and the Keys. Since that time, no specimens of this particular butterfly have been seen. It is believed to be extinct. Of the twenty-four known specimens, I am fortunate to have five, and naturally I prize these very highly.

So go the adventures of an amateur entomologist—perhaps a waste of time—yet to me—a lot of fun and relaxation.

[24] Agassiz, E. C., 1886. Louis Agassiz, his life and correspondence. Houghton Mifflin and Co., Boston, 2 vol., xiv+x+794 p., 12 pl.

[25] James, William, 1911. Memories and studies. Longmans Green and Co., New York, iv+411 p.

The Bird Collection of the Chicago Academy of Sciences*

Edward R. Ford

You bird-banders know a special pleasure in your work. Just what it is you do not find it easy to describe. Skill in luring birds, wary of the trap, is, doubtless, a part of it. Encountering a bird which you banded some years past and thinking upon the journeys it may have made in the interval — that, too, is part of it. Getting information, or having the hope that you will get it, that one of your birds has been recovered in some far region of the continent, is a very considerable part of it. It is pleasant, too, to find a marked bird, the band upon which was placed by a friend or acquaintance. An unwitting messenger has strengthened, somehow, the bond of your fellowship. Then, of course, there is the daily contact with the live, free creatures which, for a moment, you hold prisoner. You may hold one of a kind you have never met before — some wanderer from the west, storm-blown or heaven-tossed into your hands. Or you may find that a small traveller, whose life expectancy, possibly, is two years, has survived the exigencies of a precarious existence for five or even ten years. Or perhaps one of your birds wears a different dress from that it displayed when first you banded it.

It may be that all these things add something to the total of human knowledge. Just why the human mind should want to know so much is just another of the things we don't know. Since man's beginning, it would seem, he has wanted to give to all the things of earth a habitation and a name. And that is about the best reason we can give to explain bird-banders and men who work in natural history museums. That accounts for the collections in such establishments as the Chicago Academy of Sciences.

So much I offer as a brief prelude to a brief account of our bird collection here. This consists now of about 10,000 specimens. Of these there remain but few of the birds brought from Florida in 1877 by the Academy's secretary, J. W. Velie, who worked tirelessly to obtain all manner of natural history specimens to replace those lost in the "Great Fire." About this time specimens were secured, by exchange or purchase, from the Smithsonian Institution, the Academy of Natural Sciences of Philadelphia and other institutions. The late Frank N. Woodruff was the first to place emphasis on the bird collection. As curator of exhibits he did a considerable amount of field work and brought to the collection much local material as well as the results of efforts in Texas and California, and, especially, in South Dakota.

*A paper read before the Third Annual Chicagoland Bird-Banding Conference, March 20, 1943.

Alfred M. Bailey and his associates continued this work and the collection was enriched by many specimens resulting from expeditions to Colorado, Florida, Louisiana, and South Dakota. At this time an arrangement was made with Charles D. Brower, Barrow, Alaska, and with natives at Cape Prince of Wales, to supply skins of the many forms which make their summer homes in the regions of the Arctic. Meanwhile small collections from time to time made their way to the Academy. C. N. Holden, Jr., Francis S. Dayton, J. G. Parker, Jr., Eliot Blackwelder, E. W. Nelson, Ruthven Deane, and others made contributions of this sort, all helping to give our institution a working collection of North American birds.

A number of years ago the entire collection of the Museum of Northwestern University came to our hands and with it about a hundred specimens taken by Robert Kennicott, first director of the Academy. Some of the material of his expeditions had gone to the Smithsonian, some to Northwestern and some to the Academy. But that collected for us had been destroyed with the other treasures lost by fire as already noted. It was fortunate and fitting that some part of this material should come at last to this institution.

The most recent important additions to the collection are represented by the birds secured by members of the present museum staff in Arizona in 1937 and 1940. This material has not yet been critically examined but, evidently, it includes representatives of recently described forms. There is a fine series of horned larks, bridled titmice and the orioles, tanagers and flycatchers of the southwest, and a species new to the collection is represented by a pair of zone-tailed hawks.

Mention should be made, too, of the comprehensive work done by E. V. Komarek, who has been associated with the museum for a number of years. His specimens from the Great Smoky Mountains include a brown creeper, a Carolina chickadee and a savannah sparrow which have but lately been described. Also a breeding form of the red crossbill taken there appears to be of a new race. Mr. Komarek's brother, Roy, who also made collections for us in the Great Smokies, has sent desirable specimens from the Everglades of Florida.

Much historical interest attaches to many of our specimens. Among them are skins secured by biologists who accompanied the famous overland exploratory expeditions conducted by the U. S. government in the fifties and sixties. A little spotted sandpiper in natal down, collected 80 years ago, bears a label, quite evidently scrawled in the field, which gives the locality "on the Wagon Road to Ft. Bridger." How compellingly this brings to the imagination the wilderness that was the West and the spirit of adventure which excited the young naturalists who joined in this searching out of the new land. "Expedition to California," reads another label; "Expedition to Oregon," another.

Then to come upon, in our cabinets, a Steller's jay and to find that it is the only bird of this species ever to be taken in our region; and to find the first Carolina wren collected here; the only golden-crowned sparrow, collected by our lamented friend, "Bill" Lyon; one of the white-winged juncos, collected by Charles E. Aiken, who discovered this bird and for whom it was named — to come upon these and others is to link ourselves with discovery.

The Alaska skins contain several first records for North America of Eurasian birds which have crossed the straits: dotterel, spotted bluethroat, rufous-necked sandpiper, wheatear, and so on. Some of these Alaskan skins represent farthest north records in North America, as of the robin, kingbird, purple martin and tree swallow.

To one working with the Academy collection from day to day there seem to be scores of things to arouse special interest and pleasurable speculation. Here is a tern, collected by Baron von Muller in Europe in 1838, more than a hundred years ago. Through how many hands it must have passed before it found a place in mine! Here is a large redpoll which has lain in the cabinet for thirty years. Further study of it may result in another record of the greater redpoll, only one or two of which have been taken in our region. A pair of cowbirds, from the Provincial Museum of Saskatchewan, sent to Lyon when he was engaged in his fascinating experiments with these birds, may prove to be of a separate race. A female nonpareil, collected by Earl Wright in southern Louisiana, and labeled as a breeding bird, is certainly a much larger form than that found in the southeastern states.

A number of skins from a professional collector of fifty years ago are marked as coming from the Santa Cruz Valley of California, but several are of forms whose range is confined to regions farther south in Mexico. One conjectures that the collector bought them from Mexicans and placed labels upon them which identified them with their relatives of southwestern California.

A pair of Oregon gray titmice, whose range is little more than one county in southern Oregon, were suspected of being of special interest. A search into the literature disclosed that they were collected in the same place from which came the type to which the name of the new race was given. Moreover they were collected by the same man.

Bird-banders, too, have had a hand in supplying our cabinets. Many of our Colorado birds were taken by Frederick C. Lincoln; there are specimens taken by the late J. Eugene Law, for many years active among the banders of the West Coast; there are others sent to us by Edward A. McIlhenny, of Avery Island; and, finally, there are more than a few specimens obtained by Lyon. One of Lyon's birds is a hybrid flicker, of which we have another presented to us by Paul Downing.

The Academy's ornithological collection, as is the case with those of other well-known museums, is available, in part, from time to time, as a loan to investigators in this field for purposes of study and comparison. The Academy invites serious students to use its bird material and its ornithological library, under appropriate supervision and safeguards. For the general public it displays a systematic collection of mounted birds of the species found in our area. Its ecological group exhibits include birds in their appropriate association.

Upon the labels on our birds will be found the names of perhaps every well-known American ornithologist of recent generations. And as we are thus reminded of their work we are stimulated by the thought that it lies within the possibility of things that some part of our own small labors may some day have significance.

Test Your Nature Lore

1. The doodle-bug is:
   (a) a mythical insect analogous to the dodo in ornithology.
   (b) an ant-lion.
   (c) a tumbling beetle.
   (d) the larval form of a net-winged fly.
2. Which is the more accurate name for the insect known both as the June-bug and May-beetle?
3. Adult Mayflies live such a short time that they do no need to eat. (True, false)
4. If the larvae of all these aquatic insects were placed together in an aquarium, an individual in which group would have the best chance of survival?

Group I:	Group II:
dragonfly nymphs	Mayfly nymphs
damselfly nymphs	cranefly larvae
water-bug nymphs	water-boatmen nymphs
water-beetle larvae	midge larvae

5. Male mosquitos get all nourishment from plant sap. (True, False)
6. The mask of the dragonfly larva is:
   (a) a means of disguising it from its enemies.
   (b) a mechanism designed for seizing its prey.
   (c) a non-functional marking covering the upper head area.
7. Pair the numbers each with a letter:

(1) 3 pairs of legs and 3 body divisions	(a) Insects
(2) 4 pairs of legs and 2 body divisions	(b) Spiders
(3) a segmented abdomen	
(4) an unsegmented abdomen	

8. The dry flies or "spinners" made by fishermen are modeled after: (a) the caddis fly; (b) the mayfly; (c) the fish fly.
9. Syrphus flies are frequently mistaken for:
   (a) moths; (b) honey bees; (c) mosquitos. *(Answers on page 48)*

Notes from the Field

Some Unusual Bird Nesting Records for the Chicago Region

This study of the birds of the Chicago region really began in Berkshire, England in 1891. There my sister and I, accompanied by an uncle having a good working knowledge of British birds, spent much time in the country and familiarized ourselves with some forty species of birds' nests. After this English holiday we continued, in and around Chicago, to observe birds and keep records of migration dates. This activity was carried on, in a more or less haphazard way up to 1928.

Incidents of seeming unimportance often shape the course of events. On April 15th, we went for a walk and found the nests of a woodcock and long-eared owl. The latter appeared to be the first nesting record for Cook County and, thereupon, was revived the old interest in nesting records which finally led to the finding and recording of 102 species of birds' nests in the southern part of Cook County and the northeastern part of Will County. A report upon some of these finds may be of interest.

*Birds of the Chicago Region** records the last nest of an orchard oriole in 1915. The bird is an infrequent migrant and, during the years of our observations, my sister and I have made but three sight records in Chicagoland, outside of an area about two and a half miles long and less than half a mile wide, between the villages of Palos Park and Orland. Here, between June 6, 1931 and June 5, 1939, we found six nests. All were located in pear trees, although in every case other orchard trees were available.

Similarly, of eight long-eared owl's nests, seven were found in a much restricted woodland area west of Palos Park where there was a plentiful growth of wild-grape under which the owls roosted. These canopies of matted vines, or of oaks holding their last year's leaves, were their preferred roosts. The same branch was used by a roosting owl for weeks. The nest was, invariably, in an oak where an old crow's or squirrel's nest was used, with a fairly substantial lining added. One nest was found in a similar woodland, about two miles away.

No long-eared owls were seen by us except in the nesting area described. The owls were much persecuted by crows. When an owl was flushed from her eggs she was likely to lose them before she got back to the nest. This may account for the fact that two egg records for April, 1928, are so much later than three March records (March 17, 1929, 19, 1936, and 22, 1937) which apparently are near the normal nesting date for Cook County. These nests each contained six eggs, while there were only three in each of the nests found in April.

Having resolved to find the nest of the short-eared owl, we devoted a great deal of time searching the open fields in the southern part of Cook County where the birds were fairly numerous in migration and where we had seen them late enough to justify the expectation of finding a nest. Our efforts were fruitless until the evening of May 7, 1936, when a bird which we knew was in the vicinity flew across the road and swooped down close to the back of a stray dog. It was too dark to try to find the nest that night, but next day, with our springer spaniel as a "decoy," it took little time to discover it. Whenever we came close to the location

(Continued on page 44)

*By Ford, Sanborn, and Coursen, Program of Activities, Chicago Acad. Sci., vol. 5, 1934, p. 19-80.

Observations on the Feeding Habits of Some Water Snakes

The recent paper on a method of fishing used by water snakes, by Philip D. Evans,* prompts me to record some other observations on the methods employed by water snakes in locating their prey.

During the summer of 1936 while engaged in a biological réconnaissance of Reelfoot Lake, in the Mississippi River bottoms of northwestern Tennessee, I made frequent evening field trips through the shallow waters along the cypress swamp border of this large lake. Along these shores bald cypress grow in the water. Here, in water but six to twelve inches deep, the abundant schools of minnows seek refuge among the cypress from the numerous gars and predacious fish, which are constantly on the prowl in the deeper water and even venture into shallow water to secure their food. Attracted from the adjoining swamp are many diamond-back water snakes (*Natrix r. rhombifera*) and some green water snakes (*Natrix c. cyclopion*). As the gars cruise through the shallow waters, the schools of minnows break the surface in their wild attempts to elude this predator. Then the water snakes, apparently taking their cue from the sound of the splashing fish, swim vigorously forward to catch their confused prey. The minnows are trapped "between two fires"—the gars below the surface, and the water snakes above. The snakes seem unquestionably conditioned to associating the splashing of the water with their food source. On occasion a gar will break the surface with its tail as it propels itself forward, and the water snakes may be seen blindly swimming toward this place. This attraction of the snakes by splashing sounds may be readily adapted to the advantage of the collector, as I soon found out. Instead of walking quietly through the water, I found that by raising one foot and splashing the surface of the water I could attract as many as two or three snakes at once.

Snakes using this direct fishing method did not approach with their mouths open as they may in the fortuitous "combing" of the water for fish as described by Mr. Evans. As collecting was the object of my trips I have no careful observations on the behavior of the snakes in actually grasping fish as they arrived at the site of the splashing.

This nocturnal aggressive behavior of the water snakes is in marked contrast to their retiring habits during the day. While scores of snakes were seen and collected at night in the manner described above, less than half a dozen were seen during the daylight hours over a period of two months when almost every day was spent investigating the shallow waters of the lake. The few snakes seen sunning on logs or among cypress trees would slip off into the water, or into the cavities in the swollen boles of the cypress trees, at the approach of my boat.

Harold Trapido

*Chicago Nat., vol. 5, 1942, p. 53-55.

Correction

Please correct the chart caption and text, page 10 of "Telling Time by the Stars," in the April 1943 issue of *The Chicago Naturalist*, to read one month earlier for each Position number on the chart. Thus, substitute "April" for "May," "May" for "June," and "June" for "July."

We regret that, since the copy was originally prepared for March 1st, the chart was over-corrected in bringing it up to date of publication.

Museum Activities

Improvement of Building and Grounds

Visitors to the Museum this spring will have noted the new plantings of trees and shrubs on the Academy grounds. Under the direction of Robert E. Moore, Jr., landscape architect of the Chicago Park District, a large elm to the south of the main approach to the building has been replaced, the lawns have been reseeded, hawthorns have been set at the sides of the Clark Street entrance and at the east corners of the building, and Max Graf roses planted on the narrow slopes close to the building, where they will be allowed to spread over the ground. The cement walk from Clark Street to the main entrance is to be replaced and a new walk around the southwest corner of the building added during the summer.

The northwest room of the second floor, until recently occupied by a lapidary shop of the Park District's Arts and Crafts Department, is being redecorated and will be used temporarily by the museum library.

Spring Program for Young People

The new series of nine Saturday Morning Programs for Young People met with a response which justifies continuance of this feature as part of the Academy's educational program. This was the first time in thirteen years that programs for children based on voluntary attendance in out-of-school hours have been presented at the Academy. The coöperation of neighborhood schools and of the press in announcing these programs may be regarded as a recognition of the need for this type of service, particularly at a time when opportunities for the enjoyment of many nature recreation facilities have been curtailed. Despite unusually disagreeable weather, attendance averaged 76, ranging from 40 to 138.

This spring's programs were devoted to the study of birds. Future programs will make use of other films in the Academy's collection and will take advantage of educational film loan services, of which a survey has been made for available motion pictures on natural history subjects.

School Visits

A number of schools which have not previously included the Academy Museum in their annual field trip itinerary have visited the museum this season, some attracted by an announcement in the Superintendent's Bulletin of the special lobby exhibit on mushrooms or by news of the new bird song recordings and Kodachrome slides, and others by the general facilities listed in the booklet, *Educational Program, Spring 1943*, which was mailed to all neighborhood schools.

Since March 1, 2156 students in 93 class groups have visited the Academy. Seventeen special programs—guided tours, demonstrations of the Atwood Celestial Sphere, bird concerts, and motion pictures—have been presented, by appointment, to 740 students. In several instances, teachers have made another appointment for one of the other programs before leaving the building after a first visit.

New Scientific Publication

The Academy announces the publication, on May 27, of "A Preliminary Study of the Pselaphidae (Coleoptera) of Mexico," by Orlando Park, *Bulletin of the Chicago Academy of Sciences*, vol. 7, no. 3, p. 171-226, 3 pl. This is a technical study of the ant beetles of Mexico in which two new genera, one new sub-

genus, sixteen new species, and two new varieties are described, and the zoögeography of this family of insects is discussed.

Dr. Park is professor of zoölogy at Northwestern University and honorary curator of zoölogy at the Academy. His large monograph of the Neotropical ant beetles was recently published as Number 1 of the Northwestern University Studies in Biology and Medicine.

Active members of the Academy may obtain this as well as other technical papers without charge upon request.

Personal Notes

At the Annual Meeting of the Board of Trustees, May 10, 1943, John Nash Ott, Jr. of the First National Bank of Chicago was elected Treasurer, succeeding Henry S. Henschen of Evanston. Members of the Academy appreciate the loyal and efficient service which Mr. Henschen, as Trustee and Treasurer, has given to the organization over a long period of years, and wish for him a speedy return to good health.

Edward R. Ford, Honorary Curator of Ornithology, has returned to his summer home in Newaygo, Michigan. Under Mr. Ford's skillful hands during the past winter the records of the bird collection have been brought up to date, the systematic arrangement of the skins carefully checked, and a manuscript on the birds of the Chicago region—supplementing the earlier work by Ford, Sandborn and Coursen—has been prepared for publication.

(Continued from page 41)

the owls became greatly excited and dropped to the ground, close to the dog, feigning injury in an evident effort to draw the dog away. When the spaniel left the vicinity they exhibited little further concern.

The spring of 1936 was unusually dry. Possibly this was a factor in affecting food supply or nesting sites in a way that induced the owls to nest. In any case we found five nests between May 7 and June 21; four with young birds and one with four eggs hatching and three young birds. It may be interesting to note that while the long-eared owls, found nesting at intervals over nine years, used a relatively small area, the five nests of the short-eared owl were encountered at widely separated points of the territory included in our study. The nest found on May 7, 1936, seems to be another first published nesting record for Cook County.

Among other noteworthy nesting dates we have that of a piping plover with four eggs hatching on May 30, unusually early for the Chicago region. In the few published reports the first week of June for fresh eggs seems to be the average. A late record is that of a short-billed marsh wren at Oak Lawn which had a newly completed nest on July 4. This nest received no further attention until the last week of July and it was August 3 before it held a complement of eight eggs.

Then, too, we have had the luck to locate the nests of a broad-winged hawk with four eggs, at Palos Park, May 10, 1930 and of a Barn Owl with six eggs June 3, 1936—also at Palos Park—both first published Cook County nesting records. We have also found nests of a Wilson's phalarope with four eggs June 5, 1936 at Hegewisch. A nest of a LeConte's sparrow, with three eggs, was discovered May 30, 1932, at Evergreen Park. It was concealed under the matted dead meadow grass of the preceding year. The bird left the nest when it was closely approached but was exceedingly hard to flush after it had left the nest. Altogether our list, containing the names of some infrequent nesters in this region, is noteworthy enough, we hope, to be of interest to those studying the natural history of Chicago and its environs.

Edward K. Hammond

The Naturalist's Book Shelf

Science in the Garden

By H. Britton Logan and Jean-Marie Putnam in consultation with Lloyd C. Cosper.

Duell, Sloan and Pierce, New York. 1941. 255 pages, index. $2.50.

In this work the authors attempt to give the gardener enough science and directions for practice to make gardening an adventure in the horticultural arts. The work is simply written, and the directions are clear. The topics considered are very much worth while, the matter of soils, nutrition and fertilizers, mulches and cultivation, seed germination, rooting of cuttings, spraying, control of weeds, all prime topics for the amateur gardener. Of somewhat less value are the chapters that deal with such debated matters as the use of vitamin B_1, soilless growth of plants, and the use of chemical stimulators. While these things are interesting to play with (if crops are no desideratum) they are not worth much to the dirt gardener. It has been acknowledged by those who first gave impetus to the furore about B_1 that it does no good to add B_1 to soils. The reviewer's experiments with B_1 in greenhouse soils have shown it to have no merit, either as to promoting, or as to control of wilting.

The idea of adding interest to gardening by giving it an experimental approach is good, and every intelligent gardener will have a better concept of the possibilities of experimentation offered by plant material after reading this little book. It is recommended because it stresses the experimental approach to gardening, and yet one must remember that gardening done for experimental purposes must most often end in disappointment. The reviewer believes that such ideas as "miracle" chemicals, and "virgin birth" from use of substances that stimulate parthenocarpy are out of place in a work that purports to stress *science* in the garden; for none of the effects of chemicals are miraculous, and parthenocarpy has nothing to do with birth. Science is interesting enough that it can succeed without sensationalism, and a statement of the truth would have been sufficient to make the book a desirable garden handbook.

Charles A. Shull.

The Vertebrate Eye and Its Adaptive Radiation

By Gordon Lynn Walls

Cranbrook Institute of Science, Bloomfield Hills, Mich., Bull. 19. 1942. xiv, 785 pages, 197 figures, 1 plate. $6.50.

The Vertebrate Eye is unquestionably one of the most outstanding contributions to vertebrate zoology that have appeared in recent decades. It is a book not only for the opthalmologist and the ecologist, the comparative psychologist and the taxonomist, but for all biologists, professional and amateur, and laymen who wish to know about the structures, functions, and adaptations of the eye, and the origin and evolution of vision in vertebrate animals.

The general reader need not be dismayed by the size and scope of this work: it is not a "ponderous tome" to be set on a shelf and dusted off for occasional reference; it is a vivid, vital, stimulating description of what Nature has done with "leather and water and jelly" to create an all-important precision instrument. The author states that he has assumed "no more scientific knowledge on the reader's part than the contents of the usual elementary course in biology," and has lived up to this promise.

The book is divided into three main sections: *Part I—Basic* "incorporates the first bodies of information which

the reader should have if he knows little or nothing about the eye to begin with . . . . . In it, the human eye and human vision have been used to acquaint the reader thoroughly with one sample eye and its workings. The all-important retina is discussed in general terms. The origins of the eye, ontogenetic and phylogenetic, are explained; and the elementary facts of vertebrate inter-relationships are set forth so that the non-zoölogical reader will understand the necessary taxonomic allusions in Part II and the discussions of relationships and derivations in Part III."

Part II—Ecologic describes and explains the eye's adaptations to arhythmic, diurnal, and nocturnal activity, to space and motion, media and substrates (aquatic, aerial, and amphibious adaptations), and photic quality (color vision, etc.). This section will be read with greatest appreciation by those interested generally in the relationship of vision and the environment of animals.

Part III — Synoptic considers the structures and functions of vision in each of the vertebrate groups systematically. Thus if the reader is especially interested in the vision of fishes or of snakes, for example, he will find a full and complete treatment of the subject in its proper place. It is assumed, however, that he will have assimilated in advance the fundamental principles set forth in Part I.

Dr. Walls' style is in delightful contrast to that of most writers of books on morphology.* He is not whimsical, nor does he try to be "clever"; sprightly, I think, is the word for it. In the preface he concedes that his mode of expression is "strongly tainted with teleology" (look up this word, if you do not know it), but he explains that this is "merely an economy device." Certainly this will displease no one; its advantages are obvious.

*Readers of *The Chicago Naturalist* will recall with pleasure his articles "It's Done with Mirrors," vol. 1, 1938, p. 103-109, and "The Fish with the Magic Eye," vol. 2, 1939, p. 73-76.

Physically the volume is eminently satisfactory. The illustrations are abundant, exactingly lucid, and beautifully executed. The typography has been most carefully planned. The book is not "documented" in the usual sense but there is a bibliography of 26 pages. The index and glossary are combined and occupy the last 64 pages.

This volume deserves a place in every library devoted to animal biology. The Cranbrook Institute of Science and the Cranbrook Press may well take pride in this publication; their part in it merits the highest praise, and a share in the author's bouquet of orchids.

H. K. Gloyd.

This Green World

By Rutherford Platt

Dodd, Mead & Co., New York, 1943. viii, 222 pages, 74 pl. (8 colored), numerous text figures. $3.75

This Green World is the fascinating story of the seed-bearing plants—from trees and shrubs through wildflowers and grasses. It is necessarily a story, too, of changing seasons and colorful landscapes — from winter white with its well-protected tree buds to the fresh, brilliant green of spring and the final parade of lush autumn colors. Superb photographs by the author, many of them in color, admirably illustrate and enhance the delightful word-picture of the text. Complicated mechanisms are explained in terms of everyday experiences, for Mr. Platt has written with a warmth and understanding which has sacrificed neither the simplicity nor the accuracy of his delicate phrasing. Supplementary keys, "How to be a Tree Detective in Winter," "Pictorial Key to Native Evergreens," and "How to be a Tree Detective in Summer," are included. The format, carefully planned and executed, makes this book well worth its cost.

The author became interested in his plant environment when a friend showed him the specificity of the tree

buds: each tree in winter can be identified by the shape and color of the bud. In turn, he tells his reader of this regularity throughout the entire plant kingdom.

Perhaps it has never occurred to you that each tree and flower, indeed each plant and animal, has its own individual and familial features, just as you or I. Even minute pollen grains exhibit specific characters. Thus, today, botanists are able to reconstruct the vegetation of the earth forty million years ago through the identification of the pollen grains found in oil shales.

Or perhaps you had never thought of the grasses as flowering plants, that our cereal grains, wheat, oats, rye, barley, and rice are the seeds—the products of grass flowers. The source, then, of your breakfast cereal, your bread, or pudding is an inconspicuous grass flower which blooms early in the morning, usually between six and seven o'clock and stays open only about an hour.

If you have wondered why violets bloom in the spring and chrysanthemums in the fall, why leaves appear in the spring and drop in the autumn; if you have pondered the growth of plants and wondered idly if they breathe—for trees and other plants do breathe—then you should read *This Green World*. You will find this splendid book answers not only these questions but many more. Its scope is much wider than a purely botanical one, touching as it does on symmetry, patterns and arrangements, light and color, tones and tints. You will note that Mr. Platt displays an enthusiasm for the interdependence of all earthly activity: life about us is intriguing, natural mechanisms are unique. All naturalists will be stimulated — as fascinated by the insect habits and behavior as by the flower mechanisms he describes. Beginners will find encouragement in his statement, "As a business man who has had the surprise of his life, I can assert that you will enjoy looking twice at trees and flowers because they are exciting, refreshing, reassuring. Maybe you will also feel as I do that they are part of the power and glory of America, part of the sweep and dignity of life."

Kathryn J. Stephenson.

Flowers and Flowering Plants

By Raymond J. Pool

McGraw-Hill Book Co., New York and London, 1941, xxiii, 428 pages, an included chart, and 211 figures. $3.50.

Professor Pool champions the study of classification in an era of botanical history which seems concerned only with plant utilization and exploitation. The first edition of the book is already a classic for plant taxonomists. The only other proper source-books on floral parts and relationships are Gray's excellent texts of the '50's and '60's, books that are now neither adequate nor readily available.

Pool's second edition repeats the first on the structure and work of the flower and subsequent fruit. A new chapter on vegetative parts is most welcome to interested workers. Explanations of floral diagrams and formulae complete the equipment necessary to the student for an intelligent survey of flowering plants.

It is in the over-all view that Pool departs from previous text books. He sponsors the "Besseyan" system which reasons that flowering plants have followed three line of development from Ranales. The arrangement of these typical families on a chart using floral diagrams and formulae (and, in the new edition, line drawings) gives the student a complete picture of the plants and their relationships. This method has the twin advantage of putting an orderly system before the scientist and making it possible for him to place instantly a properly analyzed flower in the correct family without the use of cumbersome keys.

Descriptions of over one hundred families with relevant data, chapters on taxonomic history, field and herbarium instructions, and reference lists

complete the taxonomist's essential equipment.

The plan and method of presentation is of such disarming simplicity that the confused botanist or casual from another scientific field may be almost unwilling to believe it. It is intellectually comfortable to know that a great diversity of plant forms can be dropped neatly into natural structure categories in one single comprehensible chart.

Anna Pedersen Kummer

Handbook of Frogs and Toads

By Anna Allen Wright and Albert Hazen Wright

Comstock Publishing Co., Inc., Ithaca, N. Y., 1942. xi, 286 pages, many illustrations. $3.00.

Although the new edition of this useful handbook includes some of the taxonomic changes proposed during the nine intervening years, it differs from the first edition chiefly in having been reset and put into a stiff case binding. The latter change makes a more satisfactory book for library shelves and does not detract from its convenience if used in the field. The typography is more attractive and the illustrations are printed equally well.

An introductory section deals with various topics in the general natural history of the frogs and toads and includes keys for identification. Then follows an account of the 95 species and subspecies each (with the exception of nine) figured in several views, mostly from photographs. Each kind of frog or toad is treated under the headings Range, Habitat, Size, General Appearance, Structure, Voice, Breeding, and Notes. The last consists chiefly of quotations from other published sources and from the authors' field books.

This manual will continue to stimulate and encourage the study of the natural history of frogs and toads. It is especially suitable for school libraries and naturalists generally will make good use of it.

Zoologists will not approve the omission of the subspecific names in cases of subspecies bearing the same name as that of the species. To the uninitiated the repetition in names such as *Scaphiopus holbrookii holbrookii* and *Rana aurora aurora* may seem silly, but however objectionable, aesthetically, the tautonomy may be, such repetition—when other subspecies bearing different names are treated at one and the same time—is obligatory under the International Rules of Zoological Nomenclature. Not to follow the common practise in a systematic handbook is confusing and misleading.

H. K. Gloyd

Test Your Nature Lore

Answers to questions on page 40

1. *b* and *d*, synonymous.

2. *May-beetle.* It is a true beetle (Order *Coleoptera*), with front wings modified to horny wing-covers, rather than a bug (*Hemiptera*), with unprotected, overlapping, membranous wings.

3. True. The scientific name, *Ephemeridae*, means "living for a day," for the mouth parts of the adults are poorly developed, and it is thought that they take no nourishment.

4. In Group I, since these are carnivores and would prey on Group II (and each other).

5. True. Only female mosquitos bite in order to suck blood.

6. *b.* The mask is an enlarged lower lip, armed with spikes for grasping the larva's prey.

7. a—1, 3; b—2, 4.

8. *b.* The name "spinner" is descriptive of the mayflies' rhythmic, dancing, mass flight.

9. Syrphus flies are sunshine-loving flowerflies, and their similar food habits and appearance make them difficult to distinguish from *bees*.